THE

ONTARIO WATER RESOURCES

COMMISSION

REPORT ON

INDUSTRIAL WASTES SURVEY

OF

THE ST. LAWRENCE STARCH COMPANY

PORT CREDIT

FEBRUARY 1964

ONTARIO WATER RESOURCES COMMISSION

REPORT ON FIELD INVESTIGATIONS

DATE OF EXAMINATION - February 13, 21, 1964 PLACE - Port Credit, Ontario.

MATTER INVESTIGATED - St. Lawrence Starch Company, Limited.

AT REQUEST OF - OWRC.

INSPECTION MADE IN COMPANY WITH - R. Abbott, D. Tolson, D. Caplice.

OTHER PARTIES SEEN - J. A. D. Gray, G. Foreman.

REPORTS TO BE SENT TO -

G. M. Galimbert, Assistant General Manager.

J. A. D. Gray, Vice-President and General Manager,
St. Lawrence Starch Company, Limited,
Port Credit, Ontario.

K. H. Sharpe, Director, Division of Sanitary Engineering,
Attention: (P. G. Cockburn, District Engineer, District No. 3,
(W. A. Steggles, Supervisor, Stream Sanitation.

Industrial Wastes Branch (retained)

OTHER RECOMMENDATIONS TO THE OFFICE RE PROCEDURE TO FOLLOW -

REPORT BY H. A. Clarke.

NOTE: This completed form to be attached to each report.

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REPORT ON

AN INDUSTRIAL WASTES SURVEY

OF

THE ST. LAWRENCE STARCH COMPANY, LIMITED

PORT CREDIT, ONTARIO

February, 1964

by

H. A. Clarke

Industrial Wastes Branch

Ontario Water Resources Commission

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SUMMARY

The St. Lawrence Starch Company, Limited in Port Credit was recently the subject of an industrial wastes survey. It was found through a sampling programme conducted on February 13 and 21, 1964 that approximately 40,000 lbs. of BOD and 12,000 lbs. of suspended solids were being discharged daily to Lake Ontario. Comparison of these results with those obtained in previous surveys done in 1957 and 1962 showed that waste loadings had risen rather than fallen. The company had installed new equipment for better product quality control, but this had not resulted in less material being sewered as was claimed. Consulting engineers were commissioned to evaluate waste problems, but their findings are unknown. The OWRC recommendations of previous surveys had not been implemented, and housekeeping was poor due to frequent excessive spills of gluten to the plant sewers.

In general, the corn products industry has made considerable progress in recent years towards reasonable solutions of its pollution problems. These measures are costly to install and the possibility of impairing the quality of finished products by re-use of process water, necessitates a cautious approach to the problem. However, reductions of waste concentrations have been found to be feasible and the reluctance of the St. Lawrence Starch Company to actively pursue a course of waste treatment may be attributed to (a) economical considerations and (b) the concept that BOD is not a serious characteristic of their waste.

It is recommended that the St. Lawrence Starch Company initiate means of reducing their waste discharges to Lake Ontario and that management of the company meet with Commission representatives to discuss this problem at an early date.

REPORT

ONTARIO WATER RESOURCES COMMISSION

Municipality: Port Credit Date of Inspection: Feb. 13, 21, 1964.

Re: St. Lawrence Starch Company, Limited

Field Inspection by: D. S. Tolson, R. A. Abbott, H. A. Clarke. Report by: H. A. Clarke.

INTRODUCTION

The St. Lawrence Starch Company, Limited in Port Credit was visited on February 5, 1964 by members of the Industrial Wastes Branch of the Ontario Water Resources Commission. Mr. J. A. Gray, Vice-President and General Manager, reviewed the present operating conditions of the plant, and Mr. G. Foreman, Time-Keeper, conducted OWRC personnel on an informative in-plant tour. A sampling programme was carried out on February 13 and 21, 1964, to determine whether any remedial measures had been taken by the company to reduce pollution to the lake and, if possible, to suggest further ways and means of eliminating this problem.

HISTORICAL REVIEW

The St. Lawrence Starch Company, Limited produces such items as starches, corn syrup, cooking oil, livestock feed, etc., and has been in operation since 1889. In 1957, the Industrial Wastes Branch made its first survey of the company and followed up with another investigation in August, 1962. It was found that a waste, extremely high in BOD, was being discharged directly to Lake Ontario. Briefly, some of the recommendations of both surveys were:

(1) to reduce the waste loadings in terms of BOD and suspended solids to the lake by re-use and recycle of wash waters to the process;

(2) to separate high-volume low-pollutional wastes, for example, cooling water, from low-volume high-pollutional wastes, for example, starch wash waters, with a view to putting the latter into the municipal sewer system;

(3) to reduce spills of gluten to the sewer by improved housekeeping and in-plant control.

The company has commissioned two firms of consulting engineers at different times to evaluate their process control and industrial waste problems, but their findings are unknown to the Commission. There seems to be some feeling that due to the age of the plant, any in-plant steps to reduce pollution would cost a great deal of money. Also, company officials do not think that BOD is a realistic and harmful property of the waste as the lake provides adequate dilution. However, before this survey, the company claimed better recovery of products due to the installation of new equipment. This had resulted in less material being lost with reduced pollution to the lake.

WATER SUPPLY AND DISTRIBUTION

The company pumps its own water from Lake Ontario through a 24-inch pipe line 2,500 feet long, for industrial as well as sanitary and drinking purposes. The water treatment plant includes filtration and chlorination, while boiler feed water is softened by the zeolite process. Based on pumping capacity, about 1-1/4 million gallons of water is pumped daily and distributed throughout the processes as follows:

(1) Steeping of corn and final washing of the steep tanks.

(2) Washing of the starch in the various separatory vibrating and rotating screens, for example, the rotary vacuum filters and dorrclones.

(3) Cooling water and barometric leg water for the steep water and corn syrup evaporators.

(4) Cooling water for the oil deodorizing operations, refrigeration unit and turbines.

(5) Boiler house feed water.

(6) Backwash of the sweetland filters, the bone char filter, and the zeolite system.

(7) Pump gland water.

(8) Laundering of the filter cloths from the plate and frame feed presses.

(9) Separation of the germ from the shredded portion of the corn.

(10) Wash-ups of equipment and cleaning operations such as floor washings.

(11) Drinking and sanitary purposes.

The quantities of water used in each of the above processes are extremely difficult to calculate as no metering is done by the company.

PLANT OPERATIONS

A special type of hybrid corn is steeped in large tanks containing a dilute solution of sulfurous acid (sulfur dioxide and water) for about 36 hours at 125° F. This operation loosens the outer hull, softens the gluten and dissolves minerals and organic matter in the kernel. The steeped corn is then shredded in Sprout-Waldron double disc refiners to free, but not to crush, the germ. The steep water goes to evaporators where it is concentrated. The shredded corn is mixed with water and placed in settling tanks where the germ floats to the surface and is skimmed off by moving baffles. The germ is steam dried and the oil extracted in an oil expeller. The unrefined oil is heated, caustic added with adequate agitation, and the resulting soapy fraction settles to the bottom of the tank where it is drawn off and sold as a by-product. The refined oil is filtered and then deodorized by heating and introducing superheated steam to strip off the volatiles. The final oil is used for cooking and salad purposes.

The shredded residue from the germ separator (mentioned above) is finely ground in Buhr mills to separate the soluble starch and gluten from the fibre and the hull. The latter items are used as feed additives. The starch is separated from the gluten by washing and filtering over a series of vibrating and rotating screens and through merco centrifuges. The gluten goes to the feed tank which collects the fibre and hulls, and the concentrated steep water. This tank is constantly agitated and the mixture filtered on plate and frame presses. The solids are steam dried and sold as livestock feed while the filtrate goes to the sewer.

The liquid starch from the merco centrifuges is washed to remove impurities. It passes through a battery of nine dorrclone units where it is washed countercurrently with fresh water, and then finally over a rotary vacuum filter. The starch wash water from the rotary filter and the dorrclones is sewered. The finished starch product is then used for common laundry starch or special starches (with various additives), or converted to corn syrup by hydrolysis of the starch with formic acid. This conversion is controlled by temperature, pressure, and retention time. The resulting syrup is decolourized in bone filters, final filtered, concentrated in vacuum pans to the required density and sold as Bee Hive Corn Syrup.

Corn processed daily -- 10,000 bushels or 560,000 lbs. approximately.

SOURCES OF WASTES

These are:

(1) Starch filtrate water from the starch washing operations, e.g. the dorrclones and rotary vacuum filters.

(2) Feed press filtrate (from the plate and frame filter presses).

(3) Refinery bone char wash water -- the first four hours of the backwash contains an appreciable amount of syrup which is returned to the process. The remainder of the wash (about twelve hours) goes to the sewer as the remaining syrup is uneconomical to recover.

(4) Barometric condenser cooling water from the steep water and multiple-effect syrup evaporators -- this waste contains varying amounts of entrained solids and volatiles.

(5) Condensates and cooling water from the oil deodorizing operations -- a low-volume waste which contains condensed steam and volatiles.

(6) Sweetland filters backwash -- an intermittent, low-volume discharge as two presses may be cleaned every shift (eight hours). Therefore, maximum flow time would be about one hour every shift. This waste contains bone char and is high in BOD due to syrup losses.

(7) Cooling water for vacuum and other types of pumps and turbines in the power house.

(8) Excess steep water from the steep tanks -- this is occasional and only occurs when storage capacity or evaporating capacity is exceeded.

(9) Boiler blowdown and zeolite softeners backwash.

(10) Overflows of gluten to the sewer -- this occurred a number of times during the present survey.

(11) Cleaning operations.

The main sources of waste are the starch wash waters and the feed press filtrate. The BOD of these wastes is extremely high. However, the largest portion of the wastes comprise of cooling water from the evaporators, vacuum pumps, turbines, etc. Water used for the laundering of feed filter cloths is returned to the feed tank and is not sewered.

WASTE VOLUMES

These figures were arrived at on the basis of pipe sizes and estimated pressure heads, sewer dimensions and waste velocities, along with visual estimation of the flows. Water is not metered to the plant, but pumping capacity suggested about 1,250,000 gallons used at the time of the survey. Therefore, a total waste

volume of approximately the same figure was assumed. There was no indication as to the amounts of water being used in each individual process. Therefore, it must be stressed that the following data are attempts to arrive at reasonable figures for waste flows from the various processes. However, the accuracy of most of these flows is believed to be about or better than 10 per cent, and certainly no worse than 20 per cent.

ESTIMATED WASTE FLOW BREAKDOWN

Origin of Waste	Flow gals/24 hours		Possible Range
1. Starch wash water	200,000		150,000 - 250,000
2. Feed press filtrate	85,000		75,000 - 120,000
3. Sweetland filter backwash	7,000		5,000 - 10,000
4. Pump gland water	1,200		1,000 - 1,500
5. Process wastes (unidentified)	5,000		4,000 - 10,000
6. Cooling or wash water	10,000		5,000 - 20,000
Total (1) to (6)	308,200		
or approximately	310,000	-- (A)	
7. Periodic washings of feed press area	)		Total
8. Occasional wash water from oil refining operations	)		(7)
9. Steep tanks washups	)		to
10. Discharges of excess steep water (occasional)	)		(13)
11. Overflows from storage tanks of gluten and dilute starch water	)		140,000 gpd
12. Roof drains	)		-- (B) --
13. Floor washups (general)	)		(estimated)
Total (A) and (B)	450,000	-- (C)	
(1) to (13) Total wastes in main in-plant sewer	450,000 (measured)		400,000 - 600,000

14.	Wet well #1)	Cooling and condensate waters from the steep water and syrup evaporators, vacuum pump gland water.	200,000	150,000 - 300,000
15.	Wet well #2)		200,000	150,000 - 300,000
16.	Wet well #3)	(in oil deodorizer room) -cooling water and oil deodorizer wastes, vacuum pump gland water, cooling water for refrigeration purposes.	80,000	60,000 - 100,000
17.	Bone char filter backwash, cooling water, roof drains, vacuum pump water.		80,000	60,000 - 100,000
18.	Boiler feed, blowdown, and zeolite backwash		30,000	20,000 - 40,000
	Total (14) to (18)		590,000 -- (D)	
	(C) and (D)		1,040,000 -- (E)	
19.	Cooling water for turbines in boiler room, drinking fountains, general washups and cleanings, sanitary purposes, cooling water for compressors and other miscellaneous uses.		200,000 -- (F)	
	Total plant waste (E) and (F)		1,240,000 gallons	
	or approximately		1,250,000 gallons	

WASTE TREATMENT AND DISPOSAL

There have been in-plant measures adopted to recover more product and thus reduce the amount of materials going to the sewer. A battery of dorrclones was installed to improve the quality of starch and drains have been placed under the feed filters to reduce spillage. In general, housekeeping was found to be good, but for one noticeable exception. On both days of sampling, there was considerable spillage of gluten from storage tanks onto the floor. This material was washed into the sewer and there seemed to be no apparent concern as regards to this loss of material.

Most of the process wastes discharge into one main sewer on the ground floor of the plant. These wastes include starch wash water, feed press filtrate,

pump gland water, roof drainage, cooling water, sweetland filter backwash and occasional small flows of steep water and other unidentified process wastes which appear to contain some gluten. There are two wet wells that collect the barometric leg water from the evaporators, and in general, collect most of the cooling water in the plant.

A small wet well in the oil deodorizing room collects the oil refining wastes and some cooling water. The bone char filter backwash and some cooling water discharge to a sewer on the north side of the plant. Ultimately, the wastes from the main process sewer, the wet wells, the bone char backwash and boiler blowdown collect in one sump and then discharge directly to Lake Ontario through a 24-inch effluent pipe. Sanitary sewage goes to the town sewer line.

SAMPLING PROGRAMME

Six-hour composite samples were obtained at various locations on February 13 and 21, 1964 with individual samples taken at half-hourly intervals. The main purposes of the programme were:

(a) to discover the origin of various wastes, estimate their volumes and evaluate their properties,

(b) to determine the nature and extent of pollution to the lake.

Samples were taken of:

(1) starch wash waters from the dorrclones and rotary vacuum filters,

(2) feed press filtrate,

(3) sweetland filter backwash,

(4) unidentified low-volume process wastes,

(5) cooling and barometric leg water from wet wells No. 1 and No. 2,

(6) oil deodorizer condensates and cooling water from wet well No. 3,

(7) bone char filter backwash and cooling water,

(8) main in-plant sewer with all wastes as shown in "Estimated Waste Flow Breakdown",

(9) outfall to Lake Ontario.

ANALYTICAL RESULTS

The results of the sampling programme are given on the following laboratory sheets and are believed to be fairly representative of the individual flows for a normal day's operation. The starch wash waters, feed filtrate and sweetland filter backwash showed high BOD, which property is considered to be the main source of pollution. It is not known whether the condensates from the oil deodorizing operations were ever obtained as it was difficult to sample the wet well into which this waste and some cooling water discharged. The BOD value of 48 ppm (T-145) for this waste seems low. Also, a representative sample of the bone char filter backwash was not obtained over two days of sampling for similar reasons given above. The figure for suspended solids of 634 ppm (T-144) in the main in-plant sewer is believed to be low and should have been closer to 1,000 ppm. This is based on observing the suspended solids content of the various individual flows which combine together in the main sewer. The BOD value of wet well No. 2 (T-147) was only resolved after several determinations and much time had elapsed. Thus, the figure of 2,300 ppm is probably somewhat high, although it is noticed that the COD is 3,680 ppm. It might seem that wastes, other than cooling water and barometric leg water, are being discharged to this well. This is borne out by the analytical results of the same well on February 21, (T-206). Inefficient operation of the evaporators could result in considerable entrainment of dissolved solids and volatiles in the cooling water, but it is unlikely that a BOD of 11,800 ppm could be attributed only for this reason.

The general comments above indicate that there are some discrepancies in the data, due to reasons that are not clear at the present time. However, the results are satisfactory enough to give an overall idea of the extent of pollution attributable to this plant.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analysis except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.pm. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Port Credit   Report to: H. A. Clarke *   c.c.

Source: St. Lawrence Starch Co. Ltd.

Date Sampled: Feb. 13/64   by: H. A. Clarke & D. S. Tolson   br

Lab. No.	5-Day B.O.D.	Solids Total	Solids Susp.	Solids Diss.	Total Kjeldahl Nitrogen (N)	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$	COD	pH at Lab.				
T-138	42.	466	85	381	4.8	260	-- -	192	3.1				
T-139	2050	7760	908	6852	10	---	282	3700	6.8				
T-140	5900	9004	1414	7590	580	1050	---	10400	4.4				
T-141	6400.	9626	634	8992	640	1170	---	81600	4.6				
T-142	2950	4494	1052	3442	170	280	---	5200	5.0				
T-143	9800	14284	190	14094	1000	2060	---	16800	4.3				
T-144	46.	334	19	315	2.3	--	100	40.	7.1				
T-145	48.	256	23	233	1.5	--	100	44.	7.1				

T-138	1.	Starch water from rotary vacuum filters; composite (10.a.m. to 4.00 p.m.).
T-139	2.	Starch water and oil refinery wastes; composite (10 a.m. to 4.00 p.m.).
T-140	3.	Starch water, oil refinery and feed press wastes; composite (10.00 a.m. to 4.00 p.m.).
T-141	4.	Starch water, oil refinery, feed press and sweetland filter wastes, composite (10a.m.- 4p.m.).
T-142	5.	Total plant effluent at outfall to lake; composite(10.00 a.m. to 4.00 p.m.).
T-143	6.	Feed Press Filtrate to sewer; composite (1.00 p.m. to 4.00 p.m.).
T-144	7.	Cooling water & Bone Char Backwash; composite (10.00 to 4.00 p.m.).
T-145	8.	Wet well in Deodoriser room; composite (10.00 a.m. to 4.00 p.m.).

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analysis except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTE ANALYSIS

1 p.pm. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Port Credit   Report to: H. A. Clarke *   c.c.

Source: St. Lawrence Starch Co. Ltd.

Date Sampled: Feb. 13/64   by: H. A. Clarke & D. S. Tolson

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Lab. No.	5-Day B.O.D.	Solids Total	Solids Susp.	Solids Diss.	Total Kjeldahl Nitrogen (N)	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$	COD	pH at Lab.				
T-146	50.	276	3	273	0.39	--	88	64.	7.3				
T-147	2300.	3292	8	3204	0.84	54	--	3680.	4.6				
T-148	8600	14750	206	14544	1300	2080	--	20400.	4.1				
T-149	**80000	134726	16636	118090	86	28	--	140000.	4.8				
T-150	4500	8154	1046	7108	360	740	--	8400.	4.7				
T-151	6100	7704	1224	6480	420	820	--	8200.	4.6				

** mark as 80,000 ppm.

T-146	9.	Wet well No. 1; composite (10.00 a.m. to 4.00 p.m.).
T-147	10.	Wet well No. 2; composite (10.00 a.m. to 4.00 p.m.).
T-148	11.	Feed Press Filtrate; grab sample (4.00 p.m.).
T-149	12.	Sweetland Filter wash; grab sample (1.00 p.m.).
T-150	13.	Main Sewer (Process wastes); grab sample (1.00 P.M.).
T-151	14.	Main Sewer (before sweetland filter discharge); grab sample (1.00 p.m.).

10M-60-5546

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analysis except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals

Municipality: Port Credit   Report to: H.A. Clarke *   c.c.

Source: St. Lawrence Starch Co., Ltd.

Date Sampled: 21/2/64   by: R. Abbott HA. Clarke

Lab. No.	5-Day B.O.D.	Solids Total	Solids Susp.	Solids Diss.	pH at Lab.	Total Kjeldahl Nitrogen as N	C.O.D.	Sulphides as H_2S	Acidity as $CaCO_3$		Alkalinity as $CaCO_3$		
T-205	5.4	232	8	224	7.7	0.58	16	0	---		86		
T-206	11,800	17524	76	17448	3.1	5.0	19200	0	100		---		
T-207	390.	794	364	430	3.1	8.3	740	0	300		---		
T-208	5500.	22438	4136	18302	8.4	38	11000	0	---		956		
T-209	225.	792	550	242	6.4	22	62	0	80		---		
T-210	7600.	12186	5780	6406	4.7	56	15600	0	1062		---		
T-211	14200	14330	336	13994	4.4	1600	9800	0	1860		---		
T-212	3500.	5482	836	4646	5.5	180	6200	0	170		---		

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Lab. No.		
T-205	1.	Wet Well No. 1; Composite (10.00 a.m. - 4.00 p.m.)
T-206	2.	Wet Well No. 2; Composite (10.00 a.m. - 4.00 p.m.)
T-207	3.	Starch Water Waste; Composite (10.00 a.m. - 4.00 p.m.)
T-208	4.	Starch Water Waste; Composite (10.00 a.m. - 4.00 p.m.)
T-209	5.	Bone Char Backwash & Cooling Water; Composite (10.00 a.m. - 4.00 p.m.)
T-210	6.	Inplant Main Sewer; Composite (10.00 a.m. - 4.00 p.m.)
T-211	7.	Feed Press Filtrate (east sewer); Composite (10.00 a.m. - 4.00 p.m.)
T-212	8.	Outfall to Lake Ontario. Composite (10.00 a.m. - 4.00 p.m.)

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre = 1 lb./100,000 Imp. Gals.

Municipality: Port Credit   Report to: H.A. Clarke *   c.c.

Source: St. Lawrence Starch Co., Ltd.

Date Sampled: 21/2/64   by: R. Abbott H.A. Clarke

Lab. No.	5-Day B.O.D.	Solids Total	Solids Susp.	Solids Diss.	pH at Lab.	Total Kjeldahl Nitrogen as N	C.O.D.	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$		Sulphides as H_2S		
T-213	420.	2586	1934	652	3.2	8.3	2680	206	---		0		
T-214	1900.	4770	1836	2934	3.7	13	3880	254	---		0		
T-215	3.8	204	2	202	7.9	0.39	200	---	96		0		
T-216	400.	840	444	396	6.0	35	736	130	---		0		

T-213	9.	Oil Refining Wastes; Grab (11.00 a.m.)
T-214	10.	Starch Water Wastes & oil refining wastes; Grab 3.00 p.m.
T-215	11.	Cooling H_2O (roof); Grab 10.00 a.m.
T-216	12.	Process Wastes (unidentified): Grab 11.00 a.m.

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WASTE LOADINGS

TABLE 1

WASTE LOADINGS FOR FEBRUARY 13, 1964

lb/24 hours

	Origin	Flow mgd	BOD	Susp. Solids	Diss. Solids	Total Kjeldahl Nitrogen	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$
1.	Starch water	0.200	4,100	1,816	13,704	20	-	564
2.	Feed filtrate	0.085	8,350	162	12,000	850	1,750	-
3.	Sweetland backwash	0.007	5,600	1,120	8,260	6	2	-
4.	Pump gland	0.001	neg.	neg.	neg.	neg.	neg.	neg.
5.	Process wastes (unidentified)	0.005	20	22	20	2	neg.	neg.
6.	Cooling water	0.010	neg.	neg.	neg.	neg.	neg.	neg.
	Sub total (1-6)	0.308	18,070	3,120	33,984	878	1,752	564
7.	Other process wastes	0.142	- - - - - - - - - -not easily estimated- - - - - - -					
(A)	Main in-plant sewer (1-7)	0.450	28,800	2,860	40,500	2,880	5,270	-
8.	Bone filter	0.08	37	15	252	2	-	50
9.	Deodorizing	0.08	38	18	186	1	-	80
10.	Wet well #1	0.20	100	6	546	1	-	176
11.	Wet well #2	0.20	4,600	16	6,408	2	108	-
(B)	Sub total (8-11)	0.56	4,775	55	7,392	6	108	306
	Total (A) + (B)	1.010	33,575	3,555	47,892	2,886	5,378	890
12.	Miscellaneous other flows	0.015	- - - - - - - - - -not easily estimated- - - - - - -					
13.	Outfall to lake	1.250	37,000	13,200	43,000	2,130	3,500	-

Negligible = Less than 1 lb./24 hrs.

Comment = Mass balances in table 1 are quite good and within the limit of reasonable experimental error.

TABLE 2

WASTE LOADINGS FOR FEBRUARY 21, 1964

lb/24 hours

	Origin	Flow mgd	BOD	Susp. Solids	Diss. Solids	Total Kjeldahl Nitrogen	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$
1.	Starch water	0.200	11,000	8,272	36,604	76	-	1,912
2.	Feed filtrate	0.085	12,100	286	11,900	1,360	1,580	-
3.	Sweetland filter	0.007	5,600	1,120	8,260	6	2	-
4.	Pump gland	0.001	neg.	neg.	neg.	neg.	-	neg.
5.	Process wastes (unidentified)	0.005	20	22	20	2	neg.	-
6.	Cooling water	0.010	neg.	neg.	neg.	neg.	-	neg.
	Sub total (1-6)	0.308	28,720	9,700	56,784	1,444	1,582	1,912
7.	Other process wastes	0.142	- - - - - - - - -	-not easily estimated-	- - - - - -			
(A)	Main in-plant sewer (1-7)	0.450	34,200	26,000	28,800	252	4,770	-
8.	Bone filter	0.08	180	440	194	18	64	-
9.	Oil deodorizing	0.08	38	18	186	1	-	80
10.	Wet well #1	0.20	11	16	448	1	-	172
11.	Wet well #2	0.20	23,600	152	34,900	10	200	-
(B)	Sub total (8-11)	0.56	23,829	626	35,728	30	264	252
	Total (A) + (B)	1.010	58,029	26,626	64,528	282	5,034	252
12.	Miscellaneous other flows	0.015	- - - - - - - - -	-not easily estimated-	- - - - - -			
13.	Outfall to lake	1.250	44,000	10,500	58,000	2,250	2,130	-

Negligible = Less than 1 lb./24 hrs.

Comment = Rather greater deviations in mass balances are experienced in table 2--however, it is still useful, in that it indicates a certain level of pollution.

SUMMARY OF WASTE LOADINGS

Outfall to Lake

Date 1964	BOD lb/24 hrs.	Suspended Solids lb/24 hrs.
Feb. 13	37,000	13,200
Feb. 21	44,000	10,500

Mean values for both days of sampling were:

BOD = 40,000 lbs. or 20 tons per 24 hrs.

Suspended solids = 12,000 lbs. or 6 tons per 24 hrs.

Mass balances on waste loadings for properties such as BOD and suspended solids showed appreciable variations at times when the sums of the individual sewers were compared with the final outfall to the lake. These variations were most probably due to the intermittent discharges of flows such as the highly contaminating sweetland filter backwashes, which were always difficult to estimate accurately. However, despite these in-plant variations in waste loadings, the figures for the total final effluent to the lake were reasonably close on both sampling days. The values of 40,000 lbs. BOD and 12,000 lbs. suspended solids are believed to be reasonable estimates of the daily pollutional discharge to Lake Ontario, especially when compared with results of the same order of magnitude that were obtained in previous surveys.

Year	BOD lb/24 hrs.	Suspended Solids lb/24 hrs.
1957	22,000	10,200
1962	35,000	5,140
1964	40,000	12,000

DISCUSSION

The present results show no improvement over those of the 1957 and 1962 surveys--instead, pollution to the lake was found to be higher. Claims by the company of better recovery of material by the installation of new equipment may be true; however, the statement that less material is being sewered as a result, has not been substantiated by the present survey. The regular occurrence of gluten spills and the apparent indifference to remedy the situation when it arose, showed a lack of interest in maintaining good housekeeping. Overflows of gluten were noticed on both days of sampling, and especially on February 21, when the spill was continuous for almost the entire period over which samples were collected. There can be no doubt that due to the proteinaceous nature of this material, that the waste loadings of BOD are increased considerably to the lake by such practices.

The corn products industry, in general, has made considerable progress in recent years towards the abatement of its pollution problems. The literature describes changes and improvements that have been innovated by several companies using the wet milling process, as is the case in question here. Segregation of strong process wastes, re-use of cooling waters e.g. for washing of filters, re-use of starch wash waters e.g. for steeping, aeration of steep water condensates to reduce BOD, and many other practices are being found to be practical, useful and even somewhat economical towards the solution of the overall waste problem. These measures are costly to install and implement properly in many instances. Other factors, such as the re-use of excess process water back into the system, have to be approached cautiously because of the possibility of impairing the quality of finished products, through the introduction and build-up of excess amounts of salts and solubles. However, corn milling factories have been reducing the quantity of, and improving the quality of, their wastes, and are spending some money to achieve this end. There are claims of BOD concentrations down to the level of one population equivalent per bushel of corn processed. At the St. Lawrence Starch Company, this level is about twenty population equivalents per bushel of corn processed, which represents about the worst possible situation.

CONCLUSIONS AND RECOMMENDATIONS

The most recent survey of the St. Lawrence Starch Company showed waste loadings of approximately 40,000 lbs. of BOD and 12,000 lbs. of suspended solids being discharged daily to Lake Ontario. Despite the installation of new equipment which has presumably resulted in better product quality control, pollution to the lake has increased since 1957. It can only be concluded that no real effort has been made to decrease pollution to the lake, although remedial measures were asked for by the OWRC over the past seven years. The literature substantiates that certain measures have been used successfully elsewhere and the apparent lack of motivation by the St. Lawrence Starch Company can be attributed partly to the concept that BOD is not a serious characteristic of their waste.

Therefore, it is recommended that:

(1) the management of the Starch Company meet at an early date with representatives of the OWRC to discuss this problem,

(2) either adequate equipment and/or improved housekeeping be instituted to prevent the frequent spills of gluten to the sewer,

(3) the St. Lawrence Starch Company consider seriously and implement gradually, a programme leading to reduced pollution of Lake Ontario by plant wastes.

Prepared by:

H A Clarke
Industrial Wastes Branch

Supervised by:

R H Millest
Supervisor, Industrial Wastes Branch,
Division of Laboratories.

HAC:kf

Ontario Water Resources Comm.
DIVISION OF INDUSTRIAL WASTES.

Industrial wastes survey of
The St. Lawrence Starch Co.

Feb. 1964

DATE	ISSUED TO
Aug 2/68	B. Fraser 884-1067. Kerrybrooke Dr. Rich. Hill per. D. S. Osmond.